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COLMA
GENERAL PLAN
NOISE ELEMENT

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Martin.Carpenter.Associates, City and Regional Planners
1640 Laurel Street, San Carlos, CA 94070 (415) 593-1681

COLMA DRAFT NOISE ELEMENT

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NOISE ELEMENT

Purpose

The Noise Element is intended to describe the existing and projected future noise environments in Colma so that harmful and annoying sound levels can be avoided. In the Noise Element major noise sources are identified, noise levels throughout the community are recorded, the effects of noise on the community are discussed, and ways to minimize unwanted noise are outlined.

Relation to Other Elements

The Noise Element is closely related to the Land Use, Circulation and Housing Elements. In Colma, vehicular traffic is the primary noise generator. Noise sensitive uses, such as cemeteries and residences, should be protected from annoying noise levels. The Noise Element is to be used as a guide to determine noise compatible land uses.

Defining Noise

Sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound waves radiate away from its source in all directions. Moving sources, including streams of traffic, a moving train, river, etc., produce parallel sound waves that move in a line outward from the source. Stationary sources originate from a single point such as a horn, a motor and machinery which produce waves that travel outward in a circular pattern.

Noise is defined as "unwanted sound" and is widely acknowledged as a form of environmental degradation. Whether or not a sound is unwanted depends on when it occurs, the activity of listener, the characteristics of the sound and how intrusive it is above background noise levels. Ambient noise is the composite of near and far noise sources and is considered the normal, or existing, level of environmental noise at a given location. Over time people become less aware of and less irritated by sound which is constant. The more a noise exceeds the ambient noise, the more intrusive and less acceptable the noise is to the community. Three qualities characterize the subjective effect of noise on the listener:

1. The frequency.
2. The intensity.
3. The time-varying character.

Frequency is defined as the number of oscillations or vibrations an air particle undergoes in one second. One complete oscillation constitutes one cycle; sound frequency is measured in Hertz (Hz). One Hertz is equal to one cycle per second. Sound is comprised of a broad band of frequencies. The sound spectrum of the human ear is typically described in terms of octave bands which separate the audible frequency range into ten segments from 20- 20,000 Hertz.



Intensity is the measurement of the sound energy or pressure. The human ear is sensitive to a wide range of intensity. The range of sound pressure levels between the faintest audible sound and the loudest sound the ear can withstand is in the order of one to one billion. In order to conveniently handle this enormous range of numbers, a logarithmic scale has been established so the entire range is compressed to a range of from 0 to 180. The sound pressure scale is expressed in decibels. Because the decibel scale is logarithmic, a small decibel change represents a large change in intensity. A doubling of the sound energy results in an increase of three decibels. The human ear, however, cannot usually perceive a three decibel change, in fact, it usually takes a change of about 10 decibels before a doubling is perceived. For example, 65 dBA is perceived to be twice as loud as 55 dBA.

The time-varying character of sound is particularly important to recognize. Noise levels throughout the community do not remain constant but rather fluctuate over both time and duration. Community noise consists of sources both distant and near to the listener. Distant sources may include traffic, wind and industrial activities. Nearby sources may include individual vehicles passing by, aircraft flying overhead and trains passing by.

Measuring Noise

Because the human ear does not hear high and low frequency sounds, sound levels are measured with a sound meter using a filtering device that approximates the hearing response of the human ear. This weighting of noise measurement is called the A scale and measurements are referred to as dBA (A weighted decibel scale). The A scale weights the frequency range between 20 to 20,000 Hz. It is one of the most accurate ratings for predicting loudness because both frequency and intensity are registered.

The A-weighted scale accurately describes environmental noise at any one particular time. However, community noise levels vary continuously, therefore, all of the individual noise readings must be averaged over a period of time to give an equivalent level. The Leq is the average A-weighted noise level during a stated measurement period and is represented by a single number descriptor. The equivalent noise level for a 24-hour time period, expressed as Ldn (Day-Night Average Level) can be plotted on a map to illustrate average noise levels throughout the community.

Cumulative Noise Exposure - The Ldn

Noise from a passing truck or airplane flying overhead typically increases as the noise source approaches the listener, and subsides as the source draws away. The measurement of one such occurrence is referred to as a 'single event'. In order to determine the total impact of all the single events that occur at a given location, all of the single events must be averaged together to form the equivalent of a steady noise value. The Ldn (Day-Night Average Level) scale provides this average and is particularly well-suited for the



purpose because it recognizes that human sensitivity to noise increases during the nighttime. The Ldn divides the 24-hour day into daytime (7:00 A.M. to 10:00 P.M.) and nighttime (10:00 P.M. to 7:00 A.M.) The Ldn values represented on the noise maps include an addition of 10 dBA for nighttime levels within the 24 hour averages calculated.

The Community Noise Equivalent Level (CNEL) is another 24-hour average which includes adjustments for evening as well as nighttime noise levels. The Ldn and CNEL are very similar and for all practical purposes, measurements obtained from the two systems are the same. The national trend is toward using the Ldn system. This descriptor is recommended by the Environmental Protection Agency.

Human Reaction to Environmental Noise

At some point in time, noise pollution affects all people in an urbanized environment. The seriousness of the effect of noise depends on the tolerance of the individuals in the community, the types of activities taking place and the character of the noise. The effects of noise on people can be grouped in three categories:

1. Subjective Effects: annoyance, irritation, nuisance.
2. Interference in Activities: disruption of sleep, speech, learning.
3. Physiological Effects: stress, fatigue, temporary or permanent hearing loss.

Most sound levels produce effects in just the first two categories. No completely satisfactory measure of the subjective effects of noise can be made because of the wide range of individual reaction to noise.

High levels of noise for extended periods of time can cause a variety of physiological effects. In addition to hearing loss, continual exposure to excessive noise levels may cause symptoms of anxiety, anger and is apt to aggravate psychiatric disorders. The Environmental Protection Agency has identified 75 decibels as the highest eight-hour noise exposure threshold to prevent hearing loss.

When continuous noise levels reach 75 dBA and above, some hearing loss may begin to occur. Noise at this level is likely to be identified as a major source of annoyance by the community. The threshold of human hearing roughly corresponds to 0 dBA while the threshold of pain is approximately 120 dBA. Table N-1 lists typical A-weighted sound levels and shows that 120 dBA corresponds to a jet plane taking off at 200 feet from listener.



Noise Compatibility Standards

Over the years many studies have been performed to determine how much noise is acceptable for different land uses. The Environmental Protection Agency has given emphasis to levels deemed appropriate for residential land uses.

The California Department of Health, Office of Noise Control, has developed a compatibility chart which attempts to match each land use type with an appropriate range of noise levels. The land use compatibility chart, used in conjunction with the noise exposure contours shown on the noise maps, provides a basis for decision making. Proposals for rezoning, for example, can be evaluated for potential noise conflict without much difficulty.

Relation of Noise Element to State Code of Regulations

Title 24 of the California Code of Regulations requires that an acoustical analysis be prepared for new hotels, motels and multiple dwellings which are to be located where the Ldn is greater than 60 outdoors. The acoustical report must discuss how the exterior noise levels can be controlled to 60 Ldn, and how the noise environment inside these structures can be controlled so as not to exceed 45 Ldn. The acoustical analysis is appropriately included as part of an Environmental Impact Report or can be a separate report accompanying the building permit application when no EIR is required.

How to Use the Noise Compatibility Chart and Ldn Contours

The Ldn contours on the noise maps are estimated values based on traffic-volumes and known point noise sources. The calculated values have been adjusted to reflect noise measurements taken with a noise meter at a variety of locations and times in the community.

The Ldn contours are not intended to be precise for a given location, but rather for use as a guide to determine when site specific acoustic analysis should be undertaken. As such, the noise maps provide an early warning system in the decision making process.

The product of site specific acoustic analysis should be recommended ways in which outdoor noise levels can be controlled to the level set forth in the compatibility chart for the land use type under consideration, and, for uses covered by the California Administrative Code, recommended ways in which exterior noise can be controlled from intruding to interior spaces. Standards for the preparation of acoustical reports are as follows:

1. Minimum Contents of Acoustical Reports - Site specific reports should contain a brief description of the project and the sensitivity of the land use type to noise, an accurate map describing the setting with surrounding uses and noise sources identified,

TYPICAL A-WEIGHTED SOUND LEVELS

<u>SOUND SOURCE</u>	<u>dBA READING</u>	<u>RESPONSE</u>
Carrier Deck Operation	145	Painfully Loud
	130	Limited amplified speech
Jet Takeoff (listener at 200 feet)	120	
Auto Horn (listener 2 feet) Disco	115	Maximum vocal effort
Jet Takeoff listener at 2000 feet) Garbage Truck	100	
New York Subway Station Heavy Truck (listener 50 feet away)	90	Very annoying loudness
Alarm Clock	80	Annoying
Freight Train (listener 50 feet away)	70	Telephone use difficult
Freeway Traffic (listener 50 feet away)		Intrusive noise levels
Air Conditioning Unit (listener 20 feet away)	60	
Light Auto Traffic (listener 100 feet away)	50	Quiet
Residential Living Room	40	
Library (soft whisper at 30 feet)	30	Very quiet
Broadcasting Studio	20	
	10	Just audible
	0	Threshold of hearing

→ noises can cause hearing impairment

and a quantitative description of the noise environment. For multi-story structures the report should discuss noise effects for the upper floors. Field noise sample measurement should be taken over several days and the average Ldn calculated should be based on daytime and nighttime readings.

2. Qualifications for Preparing an Acoustical Report - Noise reports should be prepared by an acoustical engineer holding a degree in engineering, architecture, physics or allied discipline able to demonstrate a minimum of two years experience in the following areas of acoustics: transportation noise forecasting, building acoustics, field measurement of noise and noise mitigation.

Present Noise Environment in Colma

Due to the character of Colma as a Town of cemeteries, the noise environment is generally a peaceful one. A minor amount of noise is generated from residential and cemetery areas by equipment such as lawn motors, air conditioners, backhoes and power tools. Noise from heavy equipment at the Hillside Landfill and from the Town's one industrial activity, Christy Vaults located on Collins Avenue, have limited impact on the overall noise environment.

The primary contributor to the Colma noise environment is vehicular traffic on major thoroughfares. Peak noise levels are generated by truck and commuter traffic on Interstate 280 and El Camino Real, along Serramonte and Junipero Serra Boulevards. To a lesser extent the noise environment is influenced by commuter and shopping traffic on Hillside and Colma Boulevards.

Noise generated from San Francisco International Airport flyovers have little noise impact on Colma. According to airport land use capability criteria and noise contours adopted by the San Mateo County Airport Land Use Commission March 1981, impact on the Colma noise environment is less than 65 dBA.

Noise measurements were taken at a total of four different locations in Colma, using a Quest, Model 215, Sound Level Meter during August 1988. The locations at which readings were taken are shown on the 1988 Noise Map. Ldn contours were plotted using standard statistical methods based on traffic volume information supplied from city-wide traffic counts taken June 1988. The field noise measurements indicate the calculated noise contours to be conservative and the field readings coincide with the calculated contours within a 3 dBA variation.

Analysis of the contour map indicates that a very small portion of the population may be exposed to high noise levels (above 70 dBA). At specific sites the shielding effects of topography and other noise barriers such as solid walls and fences may reduce actual sound levels below that shown in the noise contours. However, the likelihood of noise impact is shown for properties fronting on El Camino Real, Junipero Serra Boulevard and Serramonte Boulevard west of El Camino Real.

Future Noise Environment in Colma

Traffic on most thoroughfares in Colma is expected to increase by two to three percent per year over the next 15 years as a result of increased development in Colma and the surrounding area. Noise contours along roadways will shift outward with major noise increases occurring along Interstate 280 and El Camino Real. Noise levels are also expected to increase due to increased traffic on El Camino Real and Junipero Serra Boulevard. Increases in noise levels along Hillside Boulevard are expected to occur particularly if the Cypress Hills planning area is developed.

Noise generated by a proposed Colma BART station at the northwest border of the Town would not significantly increase the environmental noise levels in Colma. A significant effect could occur however if a turnback track is constructed in conjunction with the station. Varying intensities of impact would occur depending on the alignment of the turnback track and whether or not the track is constructed to head underground as soon as possible south of the station. Colma has adopted a General Plan Policy in the Circulation Element directing any turnback track and/or BART line extension through Colma to be constructed underground following the former South Pacific right-of-way. No BART line extension is anticipated in the immediate future.

TABLE N-2: ESTIMATE OF RESIDENTIAL POPULATION AFFECTED BY NOISE

<u>Ldn Noise Levels dBA</u>	<u>1988 Total Population</u>	<u>Percent Population</u>	<u>Projected 1995 Total Population</u>	<u>Projected Percent Population</u>
<u>Below 60</u>	<u>527</u>	<u>74.2</u>	<u>882</u>	<u>75.4</u>
60-65	143	20.1	152	13.0
65-70	28	4.0	96	8.2
<u>70-75</u>	<u>12</u>	<u>1.7</u>	<u>40</u>	<u>3.4</u>
<u>Sub-total Above 60</u>	<u>153</u>	<u>25.8</u>	<u>288</u>	<u>24.6</u>
TOTALS	710	100.0	1170	100.0

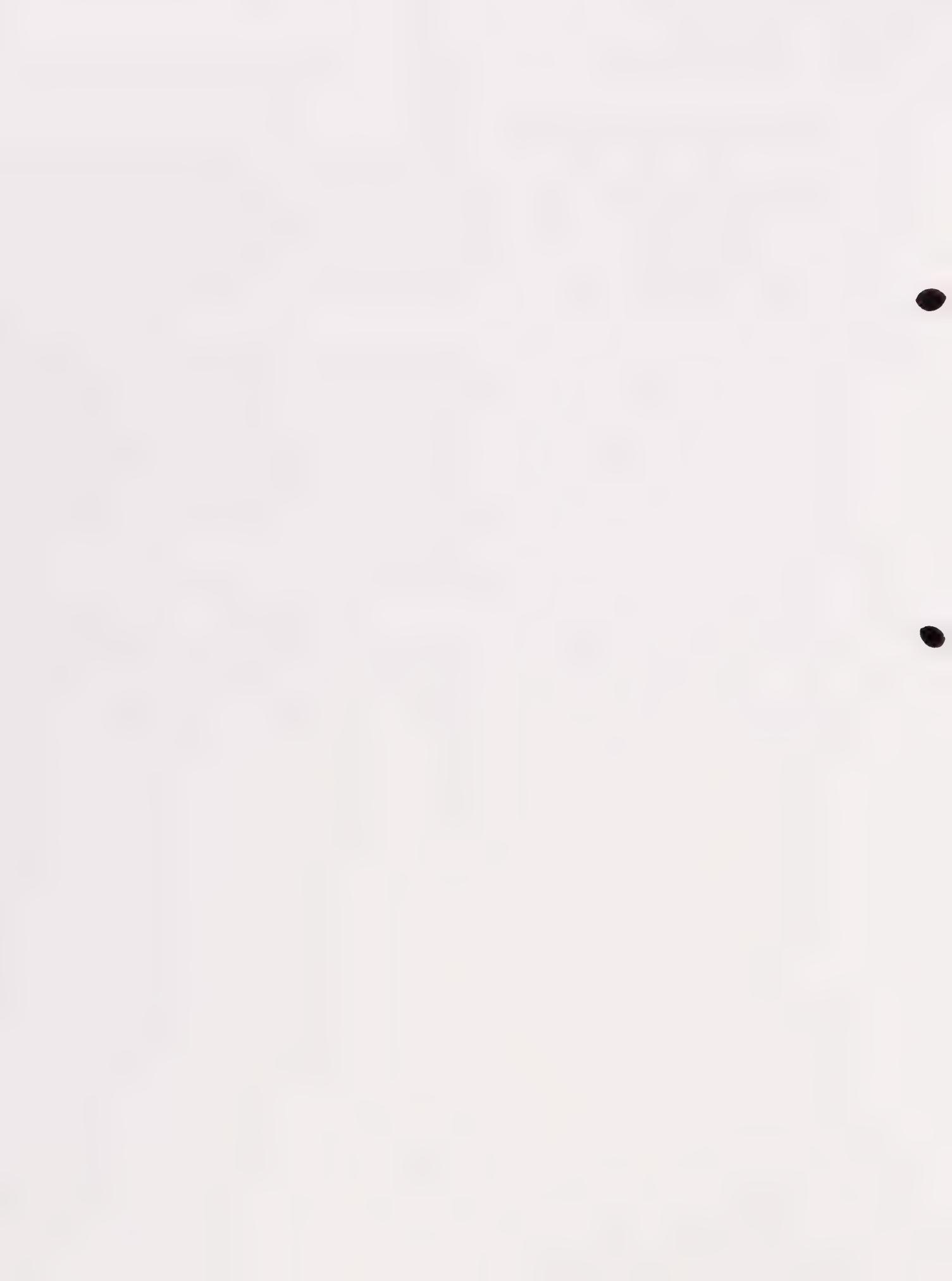


TABLE N-3
LAND USE COMPATIBILITY
FOR
COMMUNITY NOISE ENVIRONMENTS

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE LEVEL (CNEL)					
	55	60	65	70	75	80
Residential - Low Density, Single Family Homes, Duplex and Mobile Homes	██████████	██████████	██████████	██████████	██████████	██████████
Residential - Multi-family	██████████	██████████	██████████	██████████	██████████	██████████
Motels and Hotels	██████████	██████████	██████████	██████████	██████████	██████████
Schools, Libraries Churches Hospitals and Nursing Homes	██████████	██████████	██████████	██████████	██████████	██████████
Sports Arenas, Outdoor Spectator Sports	██████████	██████████	██████████	██████████	██████████	██████████
Playgrounds and Neighborhood Parks	██████████	██████████	██████████	██████████	██████████	██████████
Golf Courses, Riding Stables, Water Recreation, Cemeteries	██████████	██████████	██████████	██████████	██████████	██████████
Office Buildings	██████████	██████████	██████████	██████████	██████████	██████████
Industrial, Manufacturing, Utilities and Agriculture	██████████	██████████	██████████	██████████	██████████	██████████

INTERPRETATION



Normally
Acceptable



Conditionally
Acceptable



Normally
Unacceptable



Unacceptable

Table N-2 shows the approximate percentage of population projected to be exposed to various intensities of exterior noise levels by the year 2005. This population estimate is based on projected development policies consistent with the Colma Land Use goal of regulating population growth so as not to exceed 1500 total population by the year 2000. The number of persons expected to be living in exterior noise environments exceeding 60 Ldn would decrease from about 26 percent in 1988 to about 25 percent in 2005.

Multi-family dwellings within 350 feet of El Camino Real and within 250 feet of Hillside Boulevard, having direct line of sight to these roadways, will be impacted by noise. Specific locations may be protected by topographic or man made barriers. Where the future use falls within noise contours exceeding 60 dBA acoustic reports should be required in advance of issuing Building Permits.

Interpretation of the Land Use Compatibility Chart

Normally Acceptable. The range of noise levels in this category are compatible with the specified land use type. No special noise insulation is required in buildings of conventional construction.

Conditionally Acceptable. The range of noise levels in this category are higher than those normally acceptable for the specified land use type. A detailed acoustic study should be undertaken to set forth design features that will reduce exterior noise levels and for construction to control the amount of exterior noise reaching interior use spaces.

Normally Unacceptable. New construction or development of the specified land use type should be discouraged. If development is to proceed, a detailed acoustic study must be prepared and needed noise insulation features incorporated into the design.

Unacceptable. New development of the specified land use type should not be undertaken when the site falls within the range of noise levels in this category.

Noise Mitigation Methods

In situations where the range of noise levels are higher than that considered normally acceptable for a specified land use type, it may be possible to reduce the effective noise level to achieve better compatibility. Each site has its own characteristics and problems, thus mitigation measures which are effective for one project may not apply to another. For this reason it is not appropriate to predetermine the method by which noise levels should be reduced or controlled throughout the community. Regardless of the mitigation measure or combination of measures which is used, it is almost always less costly to include the mitigation in the design phase rather than dealing with the problem later.



The measures or combinations of measures that can be used to mitigate noise fall into four general categories:

1. Site Planning
2. Architectural Treatment
3. Noise Barriers
4. Construction Modification

Site Planning. By taking advantage of the natural shape and contour of sites it is often possible to orient buildings and other uses in a way that will reduce or eliminate noise impact. Cluster development is conducive to noise reduction. The ways in which site planning can be used to reduce noise impacts are as follows:

- . Increase the distance between the noise source and the receiver.
- . Place non-noise sensitive land uses (parking lots, maintenance facilities, utility areas) between the source and the receiver.
- . Use non-noise sensitive structures (garages) to shield noise sensitive areas.
- . Orient buildings so that outdoor areas are shielded from noise sources.

Architectural Layout. By attention to the types of uses being accommodated in a structure, the noise-sensitive uses can be moved to the quiet side of the building. Some typical examples are listed:

- . Put bedrooms on the side of the house furthest from roadways.
- . Do not locate outdoor balconies facing major roadways.
- . Design 'U' shaped buildings to shield patios.

Noise Barriers. Solid barriers between the noise source and the noise-sensitive area block out sound waves. The minimum acceptable surface weight for an effective noise barrier is four pounds per square foot (equivalent to 3/4 inch plywood) with no cracks or openings. To be effective the barrier must interrupt the line of sight between the noise source and the receiver. Noise barriers are created by topographical features in Colma. For instance, the bluff area east of El Camino Real interrupts the line of sight to residences further east. Earth berms can be created by grading to achieve the same result in some instances. It should be noted that short barriers are not effective, regardless of height, because sound waves will pass around the end of them and still reach the receiver. This effect, called flanking, can be minimized by bending the wall or barrier back from the noise source at the ends of the barrier.

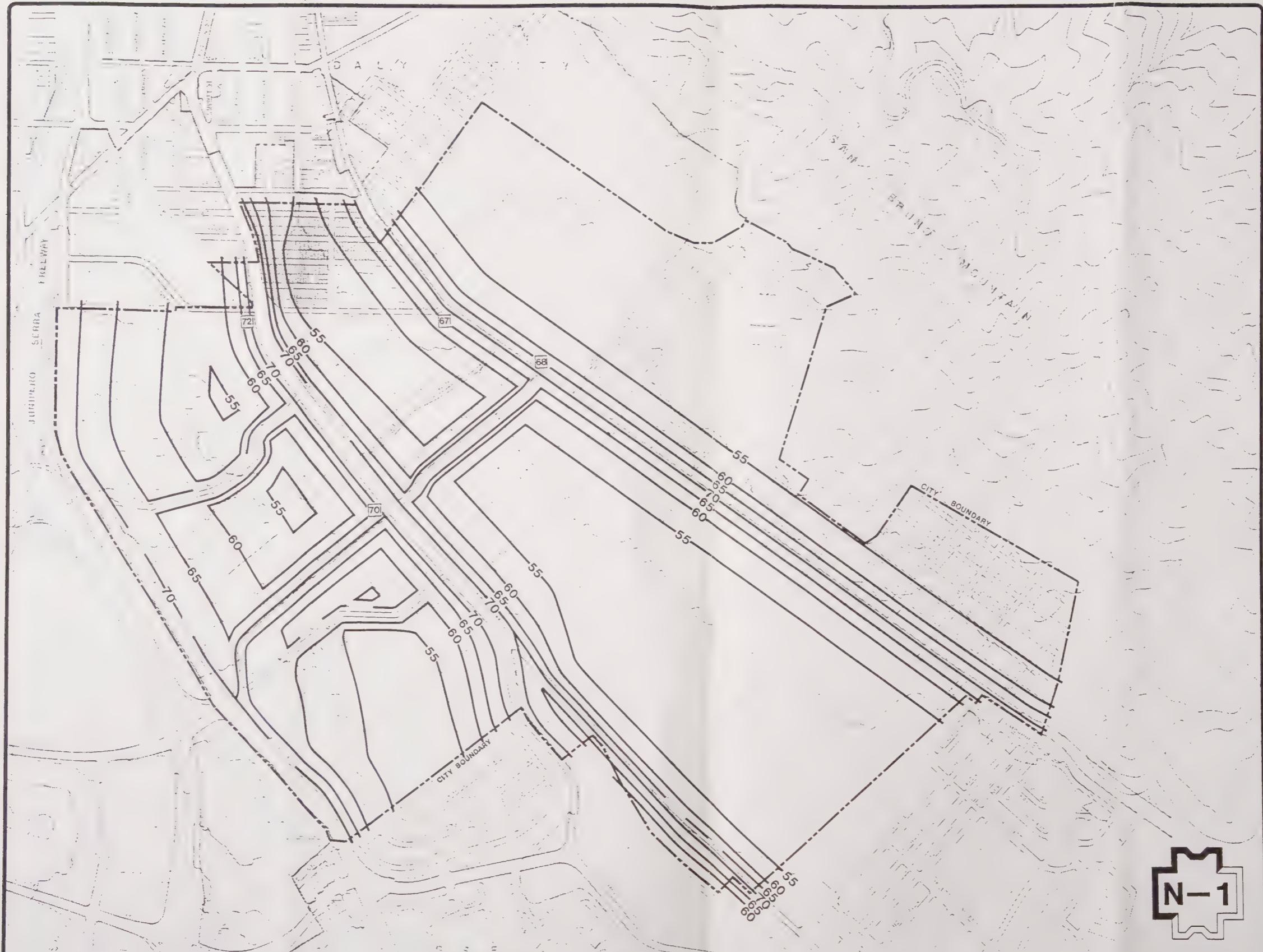
Construction Modification. Indoor noise levels due to exterior noise sources can be controlled by the noise reduction characteristics of the building's shell. In general, windows and doors are the weakest links in the acoustic skin of a building. The amount of insulation and sealing required depends on the amount of noise reduction required. The following approaches may be considered:

- Use solid core doors having an acoustic door gasket.
- Use double paned glass or completely seal windows.
- Add insulation material to walls, ceilings and floors.

CNEL (Ldn) LEVELS MEASURED AT SPECIFIC POINTS IN THE COMMUNITY

Readings were taken at four positions in the community as a check on the calculated Ldn contours and to demonstrate the effects of topographic shielding. The Ldn levels at each position are listed below, and shown on the 1988 Noise Level Map.

El Camino Real and Serramonte Boulevard	70 dBA
El Camino Real and F Street	72 dBA
Hillside Boulevard and F Street	67 dBA
Hillside Boulevard and Serramonte Boulevard	68 dBA



TOWN OF COLMA

GENERAL PLAN

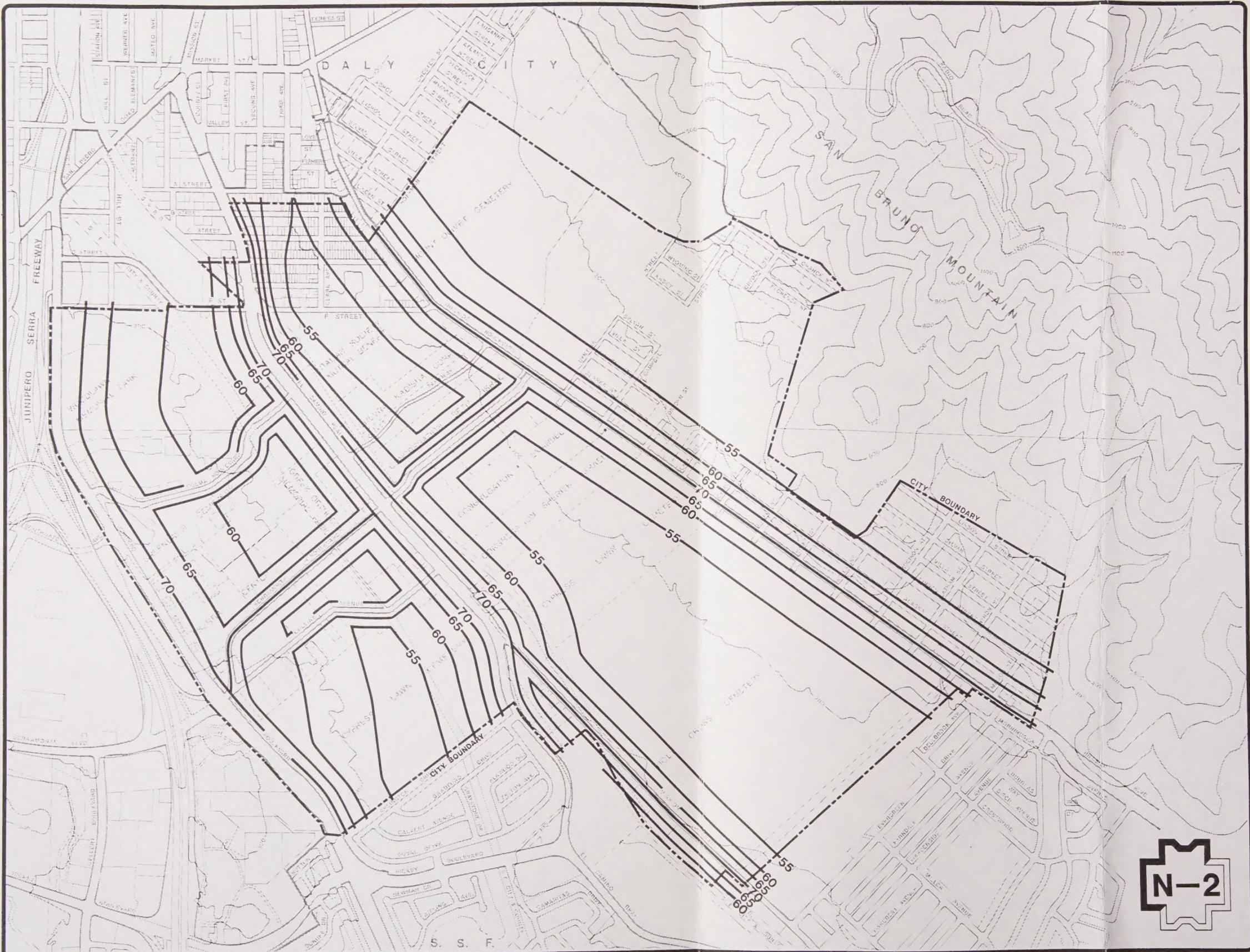
1988 NOISE CONTOURS

EQUIVALENT NOISE
LEVEL, dBA
65
Ldn CONTOURS

71 FIELD MEASUREMENT
Leq

SENSITIVE RECEPTORS





TOWN OF COLMA GENERAL PLAN

2005 NOISE CONTOURS

EQUIVALENT NOISE
LEVEL, dBA
— 65 —
Ldn CONTOURS

SCALE IN FEET
0 400 800 1200
MARTIN • CARPENTER • ASSOCIATES
CITY AND REGIONAL PLANNERS

NOISE ELEMENT POLICIES AND PROGRAMS

The following policies are set forth as a guide to help decision making with regard to noise impacts in Colma. Programs necessary for the implementation of those policies are described in the program section below.

Noise Element Policies

1. The Town will review proposed development with regard to potential noise generation impacts, to ensure that the tranquil atmosphere for the Town's memorial parks is maintained.
2. Land use decisions shall be based on the noise compatibility chart and acoustic reports required for all development in locations where noise levels exceed the "normal acceptable" range for specified land use types. If recommended in the report, mitigation measures shall be required as conditions of approval.
3. A detailed acoustic report shall be required in all cases where hotels, motels and multiple-family dwellings are proposed in areas exposed to exterior noise levels 60 Ldn or greater. If recommended in the report, mitigation measures shall be required as conditions of approval.
4. The future development of any BART tail tracks or line extension in Colma, shall be located underground along the Southern Pacific Railroad right-of-way so that environmental noise impacts would be minimized.

Programs for Noise Element Implementation

Listed below are both existing and proposed actions programs for Plan implementation. Reference is made as to whether the program is existing or proposed, the responsibility for its operation and the noise policies which are affected by its operation.

California Environmental Quality Act (CEQA) Environmental Review Procedures.
In cases where an initial study of a project indicates that noise may be a significant impact, an acoustic study is undertaken and noise mitigation measures recommended in the EIR. (Existing)

Responsibilities

City Planner - Prepares initial study; coordinates review process.

Interested Citizens - Provide input regarding report adequacy.

City Council - Decision making body; certifies report.

